

ANALYSIS SEMINAR

Asymptotics of polynomials orthogonal over the complex unit disk with respect to a positive polynomial weight

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Abstract: Consider the sequence $\{p_n(z)\}_{n=0}^{\infty}$ of polynomials of a complex variable z ($p_n(z)$ of degree n and positive leading coefficient) that are orthonormal over the unit disk $\mathbb{D} := \{z : |z| < 1\}$ with respect to a weight of the form $|h(z)|^2$, $h(z)$ a polynomial without zeros in \mathbb{D} , that is, satisfying

$$\int_{\mathbb{D}} p_n(z) \overline{p_m(z)} |h(z)|^2 dx dy = \delta_{n,m}.$$

We establish the behavior of $p_n(z)$ as $n \rightarrow \infty$ at every point of the complex plane. We shall also discuss the behavior that these formulas impose on the zeros of the polynomials p_n . A comparison with similar, known results for polynomials orthogonal over the unit circle will be made, and future research problems/extensions will be discussed.

Students are welcome.